U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE
SUBCOMMITTEE ON ENERGY

HEARING CHARTER

Department of Energy's Plan for Climate Change Technology Programs

September 20, 2006
2:00 PM - 4:00 PM
2318 Rayburn House Office Building

1. Purpose

On September 20, 2006 at 2:00 p.m., the Energy Subcommittee of the House Science Committee will hold a hearing to examine the Administration's Climate Change Technology[1] Program's (CCTP) Strategic Plan.[2] The hearing is designed to review the plan and the CCTP in the light of the Administration's own stated goals for the program and for action on climate change. The final strategic plan (a revision of the draft plan released last September) will be released at the hearing.

2. Witnesses

Mr. Stephen Eule is the Director of the U.S. Climate Change Technology Program at the Department of Energy.

Ms. Judi Greenwald is the Director of Innovative Solutions for the Pew Center on Global Climate Change.

Dr. Martin Hoffert is an emeritus professor of physics at New York University.

Mr. Chris Mottershead is a Distinguished Advisor on Energy and the Environment at BP. He is also a Director of the Carbon Trust in the United Kingdom and the Center for Clean Air Policy in the United States.

3. Overarching Questions

The hearing will address the following overarching questions:

[1] Climate change technologies reduce or avoid emissions of greenhouse gases, such as carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated compounds.
[2] U.S. Climate Change Technology Program, *U.S. Climate Change Technology Program Strategic Plan—Draft for Public Comment*, (September 2005). See: http://www.climatetechnology.gov/stratplan/draft/CCTP-SratPlan-Sept-2005.pdf

- Does the CCTP draft strategic plan provide a clear blueprint for future federal investments in climate change technologies? What program priorities are specified in the CCTP plan?

- To what extent will the CCTP plan enable the United States to achieve the Administration's stated goal of cutting greenhouse gas intensity by 18 percent over the 2002 to 2012 timeframe? Does the plan set or assume a stabilization level for concentration of atmospheric carbon dioxide?

- How could the CCTP plan be improved? What next steps are needed to implement a clear climate change technology strategy?

4. Brief Overview

- On June 11, 2001, President Bush announced the establishment of CCTP, a multi-agency research and development (R&D) coordination activity led by the Department of Energy (DOE), to focus R&D activities more effectively on the President's near- and long-term climate change goals. At the same time, the President established an interagency Climate Change Science Program (CCSP), led by the Department of Commerce, to coordinate scientific research. According to the Strategic Plan, the Federal government will spend about $2.8 billion on CCTP in Fiscal Year (FY) 2006 in nine agencies. The FY07 request is close to $3 billion. (See Appendix II.)

- On November 21, 2002, the Secretary of Energy established a CCTP office to provide staff and technical support for CCTP coordination and planning activities.

- In 2002, Under Secretary of Energy Robert Card indicated that DOE was developing a draft strategic plan for CCTP that would be released to the public by July, 2002. The plan would define the role for advanced technology in addressing climate change, establish a framework to guide R&D investment decisions for federal agencies involved in climate technology development, and identify steps toward implementation of the Administration's climate change program goals. (CSSP began a similar process and released a draft plan in November, 2002.)

- The CCTP draft plan was not released for public comment until September, 2005. Approximately 30 individuals and organizations (individual scientists, companies, consultants and interest groups) commented on the draft strategic plan, and their comments are posted on the CCTP website.[3] (A list of those commenting is Appendix III.) DOE reviewed the comments as part of its process of completing a final strategic plan. The final plan, which was delivered to the Committee on the afternoon of Sept. 19, will be released at the hearing. At first glance, the final plan does not seem to eliminate the concerns expressed by the commenters, but rather "fine tunes" the draft text.

- In general, commenters were critical of the approximately 200-page draft strategic plan, suggesting that it was a description of currently ongoing activities that provided relatively

[3] See: http://www.climatetechnology.gov/stratplan/comments/index.htm

little guidance on how to direct federal climate technology R&D activities more effectively toward achieving the Administration's stated climate change program goals. Some commenters did say that the plan provided a useful inventory of existing efforts.

- In addition to the public comments, DOE organized a series of workshops at Oak Ridge National Laboratory to review the CCTP R&D portfolio. The workshops produced a May, 2006 report, "Results of a Technical Review of the U.S. Climate Change Technology Program's R&D Portfolio."[4] The Technical Review report included timelines for technology development, identifies R&D priorities and gaps, and analyzed a subset of the R&D portfolio in terms of the potential payoff compared to the probability of technical success – elements that were not included in the draft strategic plan.

5. Issues

Does the CCTP draft strategic plan provide a clear blueprint for future federal investments in climate change technologies?

Commenters on the plan generally believed that it did not provide a clear blueprint or a basis for making or evaluating funding or policy decisions. (Chairmen Boehlert and Biggert reached a similar conclusion. See their letter, Appendix I.)

For each technology research area (e.g., nuclear energy), the plan discusses the potential role of technology, technology strategy, the current R&D portfolio and possible future research directions. The report also cites existing technology roadmaps and technical goals for some specific R&D programs.

DOE officials have generally argued that they see the plan as having a narrower purpose than do the commenters. In the Foreword to the final version of the report, the goal of the strategic plan is described as providing "a long-term planning context, taking into account the many uncertainties, in which the nature of both the challenges and the opportunities for advanced technologies are illuminated and balanced." However, the Foreword goes on to say that, along with other documents, the plan "provides a basis for setting priorities through its technology strategy and investment criteria and it highlights those opportunities that are ripe for advancement."

But, commenters said, the strategy discussion is quite general. The commenters noted that the draft plan does not provide any criteria for evaluating individual technologies. (Possible criteria include technical risk, potential cost, ease of transition to commercialization, likelihood of acceptance by the marketplace, the balance of risk across alternate technical pathways, and the timing of market entry necessary to stabilize emissions profiles.)

The commenters also complained that the draft plan does not provide criteria for allocating funding among CCTP programs and projects. (Possible criteria include the probability of technical success, the cost of adopting that technology, and the potential for market penetration.) In general, they said, the plan neither sets priorities nor adequately explains how priorities would

[4] See: http://www.ornl.gov/sci/eere/PDFs/CCTP_Wkshp_Rpt_6-28Final.pdf

be set. And while the plan cites existing timelines for some technology programs, it does not integrate them into an overall CCTP timeline.

Commenters also observed that the draft plan is silent on how federal R&D investments will be coordinated with private research efforts. One commenter observed that the draft plan does not discuss the R&D effort in the context of the broad array of statutes that are relevant to the implementation of this plan. Each of these critiques calls into question whether the draft plan fulfills the Administration's intention of having the plan serve as a framework for agencies in formulating their climate change technology R&D portfolio.

How does the CCTP strategic plan relate to the Administration's greenhouse gas emissions goals?

On February 14, 2002, President Bush said, "My Administration is committed to cutting our nation's greenhouse gas intensity – how much we emit per unit of economic activity – by 18 percent over the next 10 years. This will set America on a path to slow the growth of our greenhouse gas emissions and, as science justifies, to stop and then reverse the growth of emissions."[5] The Administration has not set a goal for limiting total U.S. greenhouse gas emissions or for a total greenhouse gas concentrations in the atmosphere. Critics note that it is the absolute concentration of gases in the atmosphere that may affect climate, and a reduction in greenhouse gas intensity will not necessarily result in a drop in total emissions. Moreover, they note that the Energy Information Administration, an independent arm of DOE, has estimated that greenhouse gas intensity would drop by 17 percent by 2012 without any government intervention.

All that aside, the draft strategic plan does not relate any of its goals explicitly to the overall Administration goal of reducing greenhouse gas intensity. Moreover, some critics argue that it is hard to judge among R&D investments without knowing what level of greenhouse gas concentration one is trying to achieve over what time period.

What other gaps have been noted in the draft strategic plan?

Commenters noted that the plan is virtually silent on the question of how to bring new technologies to the marketplace. They view this as a critical question because technology that is being purchased today will likely be in use for decades. In general, the plan is silent on policy questions.

The plan also explicitly states that it does not deal with technologies for adapting to climate change (as opposed to technologies to try to limit climate change by reducing or sequestering emissions).

Commenters have also argued that the plan doesn't adequately distinguish between technology development programs that would produce results in different time frames (short-, medium- and long-term). The commenters and technical reviewers came to diametrically opposed conclusions regarding which direction the draft plan was skewed. Many respondents during the public

[5] Office of the Press Secretary, *President Announces Clear Skies & Global Climate Change Initiatives* (February 14, 2002). See: http://www.whitehouse.gov/news/releases/2002/02/20020214-5.html.

comment period expressed the view that the plan was too focused on long-term initiatives at the expense of short- to mid-term opportunities that could have a more immediate impact on reducing greenhouse gas emissions. Conversely, experts who participated in the Technical Review, who had greater access to the plan's supporting documentation, budget profiles and technology roadmaps, concluded that CCTP's R&D portfolio was much stronger in the near-term technology development than it was in providing direction for the mid- to long-term.

The technical reviewers, in their May 2006 report, recommended greater emphasis on exploratory research addressing novel concepts to uncover breakthrough technology, enabling R&D, and integrative concepts. For example, R&D on enabling technology, such as nanotechnology, would focus resources on improving the performance of materials and subsystems that find application in a wide variety of energy production and use settings. Integrative R&D would focus resources on combining systems to provide unique advantages. These could include engineered urban planning for low greenhouse gas emissions, integrated waste management, and integration of plug-in hybrid electric vehicles with zero-emissions buildings.

How does CCTP relate to the Administration's existing climate change technology programs?

Since 2001, the Administration has undertaken a number of actions that can begin to reduce greenhouse gas emissions. Many of the Administration's signature R&D initiatives have tended to be longer term projects – the Hydrogen Fuel Initiative, FutureGen (clean coal power plant), and ITER (large-scale nuclear fusion experiment). Near-term actions include the 2006 fuel economy increases for light trucks and voluntary action such as the Methane-to-Markets program and the Climate VISION Partnership, a voluntary registry for reporting greenhouse gas reductions, and targeted incentives for greenhouse gas sequestration. A June 30, 2005 White House fact sheet that outlined the President's climate change initiatives, as shown in the table below, includes a broad range of activities. (Italicized entries denote international partnerships).[6]

The public comments and the comments from the technical reviewers suggest that the draft strategic plan could better explain how the various activities – both R&D and other policy initiatives – are linked together to achieve stated national goals.

[6] The White House, *Fact Sheet: President Bush Is Addressing Climate Change* (June 30, 2005). See: www.whitehouse.gov/news/releases/2005/06/20050630-16.html

Short Term - Present	Midterm - 2010-2020	Long Term
Hybrid or Clean Diesel Vehicles	Hybrid/Clean Diesel Vehicles	*Hydrogen*
Clean Coal Efficiency	Clean Coal Gasification	*FutureGen*
Energy Efficiency Standards	*Renewable/Efficiency Partnership*	Zero Energy Homes and Buildings
Renewable Fuel Standard	Cellulosic Biomass	Bio-Energy Systems
Nuclear Plant Re-licensing	Advanced Nuclear	*GenIV Nuclear/Fusion*
Enhanced Oil Recovery	*Geological Sequestration*	
Biological Sequestration		
Methane to Markets		
Federal Facility Management Plan		
Fuel Economy Standards		
Wind, Solar Tax Incentives		
Climate Leaders		
Climate VISION		
SmartWay Transportation		

How is the CCTP portfolio being managed, both within DOE and across agencies?

CCTP is a multi-agency planning and coordination activity with a CCTP Steering Group and six working groups. However, most of the activities in CCTP take place within DOE, which has historically struggled to coordinate efforts within the Department and to overcome "stovepiping," where different parts of an organization pursue different goals, fail to communicate well, or see other parts of the organization merely as competitors. It is not clear that DOE has solved this problem internally. For example, nuclear power has a prominent role in the CCTP plan because nuclear power plants do not emit greenhouse gases. However, the Office of Nuclear Energy and the Office of Civilian Radioactive Waste Management have continued to have trouble coordinating and making decisions about spent nuclear fuel, an issue important to both the current fleet of nuclear power plants and deployment of the next generation of plants.

Beyond describing the basic functions of the various oversight and advisory committees, the draft strategic plan does not describe or address how CCTP will overcome stovepiping and other management challenges at DOE and across agencies, coordinate budgeting activities across agencies, or set priorities to avoid duplication. One commenter observed that non-DOE activities classified as part of the CCTP for funding purposes are not a part of the CCTP functions, nor are they included in the draft plan itself.

How does the plan deal with funding?

The CCTP plan is silent on funding beyond listing funds requested for existing programs for FY 07. It does not give any sense of whether more funding would be required to pursue the "future research directions" described in the plan.

Has the process for developing the strategic plan been sufficiently open?

DOE officials argue that they have heard from experts outside the government in developing the plan, citing the posting of the draft plan on the web, the posting and review of comments, and the workshop with technical experts.

However, critics point out that this seems to be a less open and broad-based process than the CCSP has followed. The draft plan for CCSP was more broadly announced and the workshop on it was more open, and was attended by more than 1,300 participants. More than 900 pages of comments were received. In addition, the CCSP contracted with the National Academy of Sciences to review the draft plan.

6. Summary of Draft Strategic Plan for Climate Change Technology

The strategic plan describes activities carried out in nine departments and agencies: the Departments of Agriculture, Commerce, Defense, Energy, Interior and Transportation, the Environmental Protection Agency, the National Aeronautics and Space Administration and the National Science Foundation. The Department of Health and Human Services, the Department of State and the Agency for International Development also participate in planning and coordination as members of the CCTP effort; however, their activities are not included in efforts funded under CCTP. DOE accounts for 87 percent of the $2.8 billion funding under the CCTP umbrella in fiscal year 2006.[7]

The Administration's draft plan states that:

- the necessary cumulative emissions reductions [worldwide] over the course of the century could be on the order of 200 gigatons of carbon equivalents[8] to 800 gigatons of carbon equivalents (or more);
- emissions reductions of that scale potentially could be achieved through combinations of many different technologies, so a diversified approach to technology R&D is important;
- technologies with zero or near-net-zero greenhouse gas emissions would need to be available and moving into the marketplace many years before the emissions "peaks" occur in [any of] the hypothetical greenhouse gas-constrained cases; and
- some new technologies may need to be commercially ready for widespread implementation between 2020 and 2040, with initial demonstrations between 2010 and 2030. [9]

It is against these concrete insights that the six goals of the strategic plan may be assessed. These goals, articulating what the Administration aims to accomplish with the strategy, are to:

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7 *Federal Climate Change Expenditures Report to Congress* (April 2006). See http://www.whitehouse.gov/omb/legislative/fy07_climate_change.pdf

8 Emissions of non-CO_2 greenhouse gases are usually converted to a common and roughly comparable measure of the "equivalent CO_2 emissions." This conversion weights actual emissions by each gas' global warming potential (GWP). GWP is the ability of a gas, compared to that of CO_2, to trap heat in the atmosphere over a given timeframe. GWP values allow for a comparison of the impacts of emissions and reductions of different gases, although they typically have uncertainties of ± 35%. All non-CO_2 gases are compared to CO_2, which has a GWP of one. Other greenhouse gases have GWPs, using a 100-year time horizon, ranging from 23 for methane to 22,200 for sulfur hexafluoride (SF_6). (*CCTP Draft Strategic Plan*, p 7-2).

9 *CCTP Draft Strategic Plan*, p. 3-28.

1. reduce greenhouse gas emissions from energy end-use and infrastructure;
2. reduce greenhouse gas emissions from energy supply;
3. capture and sequester CO_2;
4. reduce emissions of non-CO_2 greenhouse gases;
5. improve capabilities to measure and monitor greenhouse gas emissions; and
6. bolster basic science contributions to technology development.

The Administration proposes to implement the strategic plan using a combination of the following seven "core approaches":

1. strengthen climate change technology R&D;
2. strengthen basic research at universities and federal research facilities;
3. enhance opportunities for partnerships;
4. increase international cooperation;
5. support cutting-edge technology demonstrations;
6. ensure a viable technology workforce of the future through education and training; and
7. explore and provide, as appropriate, supporting technology policy.

7. Witness Questions

Mr. Stephen Eule

1. How is the Administration using the Climate Change Technology Program (CCTP) draft strategic plan in preparing future budgets? Specifically, how will the plan enable the Department of Energy (DOE) and the Administration to choose among competing priorities and set funding requests?
2. Will the CCTP plan enable the Administration to meet its goal of cutting greenhouse gas intensity by 18 percent by 2012? If DOE were able to achieve the programmatic goals for all of the technologies listed in the plan, how would the U.S. emissions profile change in 15 years? In 25 years?
3. How can the Administration have a comprehensive and effective CCTP plan without setting as a goal a specific stabilization level for atmospheric concentration of carbon dioxide and other greenhouse gases?
4. How do you respond to critics who argue that the plan is simply a description of current activities at DOE rather than a roadmap to help the Administration set priorities and make choices among competing technologies?

Ms. Judi Greenwald, Dr. Martin Hoffert, and Mr. Chris Mottershead

1. What do you see as the key strengths and weaknesses of the plan?
2. Will the Climate Change Technology Program (CCTP) enable the Administration to meet its goal of cutting greenhouse gas intensity by 18 percent by 2012? Does CCTP put the United States on a path to stabilizing greenhouse gas emissions?
3. Does the CCTP draft strategic plan provide an integrated framework of sound guidance, clear goals and next steps for agencies and researchers to use when prioritizing and

selecting future research efforts? If so, please explain. If not, how should the Administration set research and development investment priorities among various climate change technologies and CCTP agencies?